(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 February 2020 (27.02.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/041080 A1

(51) International Patent Classification:
B60H 1/34 (2006.01) *F24F 13/10* (2006.01)

(21) International Application Number:
PCT/US2019/046610

(22) International Filing Date:
15 August 2019 (15.08.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10 2018 120 458.2
22 August 2018 (22.08.2018) DE

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,

(54) Title: AIR VENT FOR A VEHICLE

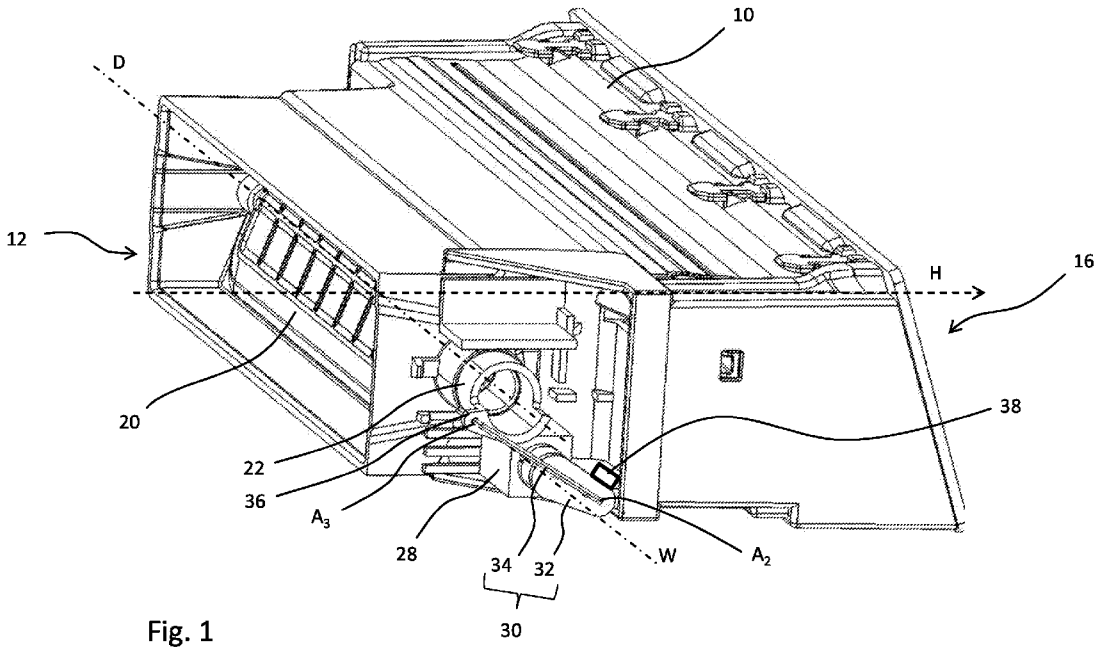


Fig. 1

(57) Abstract: An air vent for a vehicle, including a housing (10) with an inlet opening (12) and an outlet opening (16), wherein the housing (10) forms an air duct for air flowing from the inlet opening (12) to the outlet opening (16), a closure element (20) being mounted in the air duct so as to be adjustable between an open position and a closed position and an electric drive (28) being provided for adjusting the closure element (20) wherein to adjust the closure element (20) between the open position and the closed position, the electric drive (28) acts on the closure element (20) by way of a toggle lever mechanism (30).

WO 2020/041080 A1

[Continued on next page]

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

AIR VENT FOR A VEHICLE

TECHNICAL FIELD

[0001] The invention concerns an air vent for a vehicle, comprising a housing with an inlet opening and an outlet opening, the housing forming an air duct for air flowing from the inlet opening to the outlet opening, furthermore comprising a closure element mounted in the air duct so as to be adjustable between an open position and a closed position, and an electric drive for adjusting the closure element.

BACKGROUND

[0002] Air vents of the above-mentioned type serve to supply air into a vehicle interior. Fresh air supplied from outside the vehicle, or air taken from the vehicle interior, may be conducted via the inlet opening into the air duct formed by the housing, through said air duct and up to the outlet opening into the interior of the vehicle. The vehicle may for example be a car or a truck. To deflect the air from a main flow direction, adjustable air guidance elements, for example pivotable air-guiding slats, may be arranged in the housing. The free flow cross-section of the air duct can be changed and in particular reduced to zero via the closure element. Thus the air flow passing through the air duct can be choked or completely interrupted when the closure element is in the closed position. Such a closure element may be adjusted for example mechanically via a control wheel or electrically via a motor provided to this end.

[0003] It is always a challenge to achieve a sufficiently tight closure of the air duct when the closure element is in the closed position, i.e. as complete an interruption of the air flow as possible. With a closure element which is pivotable about a rotation axis, such as for example a closing flap, a sufficiently high torque must act on the closure element. A high torque is also frequently necessary to prevent undesirable movement of the closure element out of the closed position on loss of power or on vibrations occurring during operation of the air vent. If the closure element is to be adjusted by an electric motor, in the case of closure element which is pivotable about a rotation axis, a motor must be provided which sits on a drive shaft running along the rotation axis. In order to achieve the required high torque, correspondingly powerful systems of motor and gear mechanism must be fitted, which however require considerably installation space. DE 10 2016 103 644 B3 describes

such a ventilation device with electronically adjustable closure element, the rotation axis of which sits on a drive shaft of an electric motor via a spring coupling, wherein a diaphragm of the ventilation device can be pivoted using a lever arrangement.

SUMMARY

[0004] On the basis of the prior art outlined above, the object of the invention is to provide an air vent for a vehicle which allows a sufficiently tight closure of the air duct when the closure element is in the closed position, while taking up little installation space.

[0005] The invention achieves this object with an air vent according to claim 1. Advantageous embodiments are the subject of the dependent claims, the description and the figures.

[0006] In the air vent according to the invention of the type described initially, for adjusting the closure element between the open position and the closed position, the electric drive acts on the closure element by way of a toggle lever mechanism.

[0007] As already mentioned initially, air can flow from the inlet opening through the air duct to the outlet opening and out of this, in particular into a vehicle interior. The air vent may have air guidance elements which deflect the air flow passing through the air duct from a main flow direction into a desired direction. Also, the air flow may be choked by the closure element and be completely interrupted, also as mentioned above. The closure element may in particular be pivotable about a rotation axis. For example, the closure element may comprise a closing flap, as will be explained below. When the closure element is in the closed position, the air flow passing through the air duct is completely interrupted, i.e. the free flow cross-section is reduced to zero. In the open position however, the free flow cross-section is greater than zero, and the air flow can pass - at least to the choked extent but in particular unchoked - through the air duct in the manner explained and emerge from the outlet opening. The closure element is here adjustable via an electric drive, i.e. can be moved to and fro between the open position and closed position by means of the electric drive. If a closing flap pivotable about a rotation axis is provided as the closure element, this can be pivoted about the rotation axis accordingly between the open position and closed position by means of the drive. The electric drive may in particular

comprise an electric motor. The closure element may therefore be adjustable by electric motor.

[0008] According to the invention, the electric drive acts on the closure element via a toggle lever mechanism. In particular, an electric motor of the drive may act on the toggle lever mechanism. The toggle lever mechanism may comprise two lever elements connected so as to be rotationally movable relative to each other, wherein a first lever element is rotatable via a turning shaft connected to the drive, and wherein rotation of the first lever element about the turning shaft moves the second lever element. The first lever element and/or the second lever element may for example comprise a lever arm or a lever rod. The second lever element may act on the closure element. At first glance, it may appear unnecessarily awkward to connect the drive to the closure element via a toggle lever mechanism, since finally the drive could be connected directly to the closure element, for example arranged on a rotation axis of the pivotable closing flap as mentioned initially. The inventors have however found that when the drive is connected to the closure element via a toggle lever mechanism, even a relatively slight torque applied by the drive leads to a sufficiently high closing force acting on the closure element. Because of the lever effect of the toggle lever mechanism, the drive need therefore only apply a smaller torque in order to apply a closing force on the closure element which is comparable to the closing forces applied by the known motors. Thus an electric drive, in particular an electric motor, with a smaller capacity may be used, and hence with a smaller installation space requirement. Thus because of the connection of the lever mechanism to the electric drive according to the invention, with a low torque, a high closing force can be exerted on the closure element.

[0009] According to one embodiment, retaining means are provided that keep the closure element in the closed position. In particular, the toggle lever mechanism may be limited in its movement such that the closure element is held in the closed position. Held in the closed position here means that the closure element offers a certain resistance against the movement out of the closed position into the open position. For example, in the case of a closing flap pivotable about a rotation axis as a closure element, initially a specific torque may need to be applied. According to this embodiment, the retaining means keep the toggle lever mechanism in the extended state, in the closed position. The term "extended state" designates, in the known fashion, a state in which the toggle lever mechanism has been

moved beyond the dead point of the toggle lever mechanism. The toggle lever mechanism may thereby be locked in the closed position. Release of the toggle lever mechanism, i.e. movement of the closure element from the closed position to the open position, can only be achieved by overcoming a certain resistance. On movement of the toggle lever mechanism beyond the dead point, the closing force of the closure element indeed decreases slightly. Because of the force which the closure element applies against the closing force, however, the toggle lever mechanism is locked in the closed position by the retaining means. With such retaining means, the closure element can be kept securely in the closed position even when the drive is unpowered and when vibrations occur in operation of the air vent. Accordingly, no high torque is required for maintaining the closed position, in contrast to known closure elements which are adjustable by electric motor. The retaining means may for example be a stop. In particular, the toggle lever mechanism may comprise two lever elements connected so as to be rotationally movable relative to each other, wherein a first lever element is rotatable about a turning shaft connected to the drive, and wherein rotation of the first lever element about the turning shaft causes movement of the second lever element, wherein when the closure element is in the closed position, the first lever element hits a stop which limits the movement of the first lever element about the turning shaft, and/or wherein when the closure element is in the closed position, the second lever element hits a stop which limits the movement of the second lever element. By limiting the movement of the first lever element or the second lever element, naturally also the movement of the second lever element or the first lever element, and hence of the entire toggle lever mechanism, is limited. The closure element may be held in the closed position by such a stop. As already stated, the second lever element may be connected to the closure element and hence transmit the movement of the drive to the closure element.

[0010] According to one embodiment, the closure element comprises at least one closing flap that is pivotable about an axis of rotation. In particular, the air vent may comprise precisely one closing flap. Also however, several closing flaps may be provided, each of which may be mounted in the air duct so as to be pivotable about a rotation axis. If several closing flaps are provided, these may - in particular in collaboration with adjacent closing flaps - close the air duct in the closed position. The toggle lever mechanism here acts on the at least one closing flap such that this is pivoted about its rotation axis between the open position and the closed position. According to an embodiment in this context, the toggle

lever mechanism comprises two lever elements that are connected so as to be rotationally movable relative to each other, a first lever element being rotatable via a turning shaft connected to the drive and a second lever element being moved by a rotation of the first lever element about the turning shaft, wherein the second lever element is connected to the closing flap at an attachment point lying outside the rotation axis of the at least one closing flap. The toggle lever mechanism may accordingly, as already stated above, comprise two lever elements which are rotationally movable relative to each other. The attachment point may for example be arranged on a plate or an extension, wherein the plate or extension may be arranged on a turning shaft running along the rotation axis. The plate or extension thereby produces a lever arm.

[0011] According to one embodiment, the closure element comprises two closing flaps that are pivotable in opposite directions to one another about a common rotation axis. The closure element may thereby form a butterfly valve. According to one embodiment in this context, the toggle lever mechanism acts on the closing flaps by way of a gear mechanism. The gear mechanism may comprise a first gearwheel and two second gearwheels connected to the first gearwheel and in particular turning in opposite directions. Here, the first gearwheel may be connected to the toggle lever mechanism and the second gear wheels may each be connected to a respective closing flap. Here again, the toggle lever mechanism may comprise two lever elements connected so as to be rotationally movable relative to each other, as explained above. The second lever element may act on the first gearwheel, the rotation axis of which may be oriented in particular perpendicularly to the rotation axis of the closing flaps, so that rotation of the first gearwheel moves the two second gearwheels in opposite directions and the two closing flaps are thereby pivoted against each other between the open position and the closed position. Via this mechanism, it is possible also to adjust a butterfly valve between the open position and closed position by means of a toggle lever mechanism.

[0012] According to another embodiment, the closure element is formed by a number of jointly pivotable air-guiding slats arranged in the air duct. The air-guiding slats may form a slat package, wherein the slat package may in particular close the air duct completely in the closed position. The air-guiding slats may serve to deflect the air flow from a main flow direction. Also, the air-guiding slats here function as closing flaps. The air-guiding slats may each be configured to be pivotable between two end positions, and jointly close the air

duct in at least one of the end positions. Also, the air-guiding slats may close the air duct in both end positions. Accordingly, the closure element is in the closed position when the air-guiding slats are in the respective end positions. According to an embodiment in this context, the toggle lever mechanism acts on the air-guiding slats by way of a coupling rod coupling the air-guiding slats to one another in their movement. Here too, the toggle lever mechanism may comprise two lever elements connected so as to be rotationally movable relative to each other, as explained above. The second lever element may act on the coupling rod and in particular move this along an arc. The air-guiding slats may be pivoted about their respective rotation axes via the coupling rod moved by the toggle lever mechanism. According to another embodiment, one of the air-guiding slats is formed as a control slat, on which the toggle lever mechanism acts directly, wherein a coupling rod transmits the movement of this control slat to the further air-guiding slats. The toggle lever mechanism may thus act in particular only on one air-guiding slat, wherein a movement of this air-guiding slat (here designated the control slat) can be transmitted to the other air-guiding slats via the coupling rod.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Some exemplary embodiments of the invention are explained below with reference to the figures. The drawings show:

[0014] Figure 1 an air vent according to the invention in a first embodiment,

[0015] Figures 2-4 sectional views through the air vent in figure 1 with different positions of the closure element formed as a closing flap,

[0016] Figures 5-7 sectional views through an air vent according to the invention in a second embodiment, with a closure element configured as a butterfly valve in different positions,

[0017] Figures 8-11 a sectional view through an air vent according to the invention in a third embodiment, with air-guiding slats as closure elements in different positions.

[0018] Unless indicated otherwise, the same reference signs indicate the same objects below.

DETAILED DESCRIPTION

[0019] Figures 1 to 4 show an air vent according to a first embodiment. The air vent comprises a housing 10 with an inlet opening 12 and an outlet opening 16, wherein the housing 10 delimits an air duct 14. An air flow may pass through the air duct 14 from the inlet opening 12 to the outlet opening 16 in a main flow direction H. A closing flap 20, mounted on the housing 10 so as to be pivotable about a rotation axis D, is arranged in the air duct 14. A bearing end 22 of the closing flap 20 here extends through a bearing opening of the housing 10 and thus protrudes from the housing 10. The closing flap 20 acts as a closure element and can be pivoted about the rotation axis D between an open position and a closed position, as will be explained in more detail below. This adjustability of the closing flap 20 is guaranteed via an electric drive with an electric motor 28. The electric motor 28 is arranged offset to the rotation axis D of the closing flap 20, and may in particular be connected to the housing 10 on the outside.

[0020] According to the invention, the drive 28 acts on the closing flap 20 via a toggle lever mechanism 30, and thus allows the closing flap 20 to be pivoted about its rotation axis D. The toggle lever mechanism 30 comprises a first lever element 32 configured as an elongate lever arm, which sits on a turning shaft (not shown) of the drive 28 and is mounted so as to be rotatable about the axis W of the turning shaft of the drive 28. The axis W runs through an attachment point A_1 at a first end of the first lever element 32. One end of a second lever element 34, configured as a lever rod, is connected to the first lever element 32 in rotationally movable fashion at an attachment point A_2 on a second end of the first lever element 32 lying opposite the first end. The other end of the lever rod 34 is connected to the bearing element 22 of the closing flap 20 at an attachment point A_3 lying outside the rotation axis D of the closing flap 20. The attachment point A_3 here lies on a protrusion 36 of the bearing element 22 pointing radially away from the rotation axis D of the closing flap 20. The drawing also shows a stop 38, depicted purely diagrammatically.

[0021] With reference to the sectional views in figures 2 to 4, the movement mechanics of the toggle lever mechanism 30 will be explained below. Figure 2 shows the closing flap 20 in its closed position. Here, mutually opposing end edges of the closing flap 20 lie tightly against the housing protrusions 11 protruding into the air duct 14. The toggle lever mechanism 30 is here in an extended state, wherein the first lever element 32 lies against

the stop 38. The toggle lever mechanism 30 is therefore in a locked state because of the stop. In this extended state, the toggle lever mechanism 30 has just passed its dead point, at which the attachment points A_1, A_2, A_3 lie on a common straight line, during a rotational movement against the arrow direction 60. In contrast to their positioning at the dead point, the first lever arm 32 and the second lever arm 34 now no longer lie parallel to each other. By means of the toggle lever mechanism 30, via the bearing element 22, a torque is exerted on the closing flap 20 which forces the closing flap 20 into the closed position shown in figure 2. The stop 38 acting as a retaining means prevents movement of the first lever arm 32 against the arrow direction marked with reference sign 60, i.e. against turning counterclockwise about the attachment point A_1. A clockwise turning movement of the lever element 32 about the axis W running through the attachment point A_1 - i.e. in the direction of arrow 60 - requires the application of a defined torque in order to pass the above-mentioned dead point and move the closing flap 20 into an open position. The closing flap 20 is thus securely held in the closed position.

[0022] If the electric motor 28 now pivots the first lever element 32 clockwise about the axis W running through the attachment point A_1, the dead point is passed and, via the second lever element 34, the closing flap 20 is also pivoted clockwise about its rotation axis D. The closing flap thereby reaches the open position shown in figure 3. In the open position shown in figure 3, the closing flap 20 is only partially opened, and thus chokes the air flow passing in the main flow direction. If the first lever element 32 is now turned further clockwise, the closing flap 20 can be brought into a fully opened position shown in figure 4. This position is regarded as the open position. A lever mechanism is created by the first lever element 32, the second lever element 34 and also by the arrangement of the third attachment point A_3 offset to the rotation axis D.

[0023] Because of the toggle lever mechanism provided according to the invention and the associated lever mechanism, a sufficiently high closing force may be applied to the closing flap in the closed position while a relatively small torque is applied by the electric motor thanks to the lever effect. The torque to be applied by the electric motor in order to achieve a comparable closing force is therefore substantially smaller than in motors acting directly on the rotation axis of the closing flap. Thus with the air vent according to the invention, the drive may be designed substantially smaller and thus take up less installation space.

[0024] Figures 5 to 7 show an air vent according to the invention in a second embodiment, wherein in particular the closure element is configured differently. In these sectional views, the housing 10 is shown merely in cross-section. The closure element here comprises two closing flaps 120 which are pivotable in opposite directions to each other about a common rotation axis D. The second lever element 34 of the lever mechanism 30 is here coupled via its attachment point A_3 to a protrusion 136 of the first gearwheel 40. The first gearwheel 40 can be rotated about a rotation axis Z which runs parallel to the main flow direction H. The closing flaps 120 here each have a second gearwheel 42, wherein the second gearwheels 42 stand in engagement with the first gearwheel 40. The second gearwheels 42 here engage from opposite sides in the toothing of the first gearwheel 40 standing obliquely to the rotation axis Z, so that on rotation of the first gearwheel 40 about the rotation axis Z, the second gearwheels 42 are turned in opposite directions to each other. Thus by the electric motor 28 and the toggle lever mechanism 30, the first gearwheel 40 can be rotated about its rotation axis Z, and hence the closing flaps 120 can be pivoted in opposite directions to each other about their rotation axis D. The two closing flaps thus form a butterfly valve. The gearwheels 40, 42 form a gear mechanism via which the toggle lever mechanism acts on the closing flaps 120.

[0025] Figure 5 shows the closed position of the closing flaps 120, wherein the end edges of the closing flaps 120 opposite the rotation axis D stop against housing stops 111. The toggle lever mechanism 30 is here again in an extended state, wherein the first lever element 32 also hits on a stop 38 depicted diagrammatically. In figure 6, the toggle lever mechanism has been released from the locked state by rotation of the first lever element 32 clockwise about its axis W, and the closing flaps 120 have thus been transferred to an open position in which the closing flaps are at least partially opened. On further rotation of the first lever element 32 about its axis W, the closing flaps 120 can be moved into a fully open state as shown in figure 7. This is also known as an open position. In this embodiment too, because of the toggle lever mechanism, low torques can lead to a high closing force acting on the closing flaps, which achieves the advantages already described above.

[0026] Figures 8 to 11 show a third embodiment of the air vent according to the invention, wherein here several (in total seven) jointly pivotable air-guiding slats 220 are arranged in the air duct 14 as a closure element. The second lever element 34 of the toggle lever mechanism 30 is connected to the air-guiding slats 220 via a coupling rod 50. A

rotational movement of the first lever element 32 about its axis W moves the coupling rod 50 along an arc, and the air-guiding slats 220 are thus pivoted about their respective rotation axes D.

[0027] Figure 8 again shows the closed position of the air-guiding slats 220. The outer air-guiding slats here hit the housing stops 211. Here too, the toggle lever mechanism is in an extended state, wherein the first lever element 32 hits a stop 38.

[0028] In figures 9 to 11, the air-guiding slats 220 are shown in different open positions. The air-guiding slats here serve not only to close the air duct or choke the air flow, but also to deflect the air flow. In the view in figure 9, the air-guiding slats 220 are oriented such that the air flow can be deflected to the left from the main flow direction H. In the depiction in figure 10, the air-guiding slats 220 are oriented parallel to the main flow direction H, so that no air deflection takes place. Finally in figure 11, the air-guiding slats 220 are arranged such that the air flow is deflected to the right from the main flow direction H. In figure 11, the toggle lever mechanism 30 is at its second dead point, i.e. here again, all attachment points A_1 to A_3 lie on a common straight line. With the toggle lever mechanism provided according to the invention, even with a closure element formed by air-guiding slats, a relatively small torque to be applied by the motor can be transferred into a high closing force of the air-guiding slats.

[0029] As evident from the embodiments described, the lever elements 32, 34 of the toggle lever mechanism may run such that, in the position of maximum closing force acting on the respective closure element (i.e. at one of the dead points), the lever elements 32, 34 stand parallel above each other (first embodiment), or the second lever element 34 forms an extension to the first lever element 32.

List of Reference Signs

10	Housing
11	Housing protrusions
12	Inlet opening
14	Air duct
16	Outlet opening
20	Closing flap
22	Bearing end
28	Drive
30	Toggle lever mechanism
32	First lever element
34	Second lever element
36	Protrusion
38	Stop
40	First gearwheel
42	Second gearwheel
50	Coupling rod
60	Arrow line
111	Housing stops
120	Closing flaps
136	Protrusion
211	Housing stops
220	Air-guiding slats
A_1, A_2, A_3	Attachment points
D	Rotation axes
H	Main flow direction
W	Axis
Z	Rotation axis

CLAIMS

1. Air vent for a vehicle, comprising a housing (10) with an inlet opening (12) and an outlet opening (16), the housing (10) forming an air duct (14) for air flowing from the inlet opening (12) to the outlet opening (16), further comprising a closure element (20), mounted in the air duct (14) displaceably between an open position and a closed position, and an electrical drive (28) for adjusting the closure element (20), characterized in that, for adjusting the closure element (20) between the open position and the closed position, the electrical drive (28) acts on the closure element (20) by way of a toggle lever mechanism (30).

2. Air vent according to Claim 1, characterized in that retaining means (38) that keep the closure element (20) in the closed position are provided.

3. Air vent according to Claim 2, characterized in that, in the closed position, the retaining means (38) keep the toggle lever mechanism (30) in an extended state.

4. Air vent according to one of the preceding claims, characterized in that the closure element comprises at least one closure flap (20) that is pivotable about an axis of rotation (D).

5. Air vent according to Claim 4, characterized in that the toggle lever mechanism (30) comprises two lever elements (32, 34) that are connected rotationally movably in relation to one another, a first lever element (32) being rotatable by way of a turning shaft (W) connected to the drive (28) and a second lever element (34) being moved by a turning of the first lever element (32) about the turning shaft (W), the second lever element (34) being connected to the closure flap (20) at an attachment point (A_3) lying outside the axis of rotation (D) of the at least one closure flap (20).

6. Air vent according to one of Claims 1 to 3, characterized in that the closure element comprises two closure flaps (120) that are pivotable oppositely in relation to one another about a common axis of rotation (D).

7. Air vent according to Claim 6, characterized in that the toggle lever mechanism (30) acts on the closure flaps (120) by way of a gear mechanism (40, 42).

8. Air vent according to one of Claims 1 to 3, characterized in that the closure element is formed by a number of jointly pivotable air-guiding slats (220) arranged in the air duct (14).

9. Air vent according to Claim 8, characterized in that the toggle lever mechanism (30) acts on the air-guiding slats (220) by way of a coupling rod (50) coupling the air-guiding slats (220) to one another in their movement.

10. Air vent according to Claim 8, characterized in that one of the air-guiding slats (220) is formed as a control slat, on which the toggle lever mechanism (30) acts directly, a coupling rod transmitting the movement of this control slat to the other air-guiding slats.

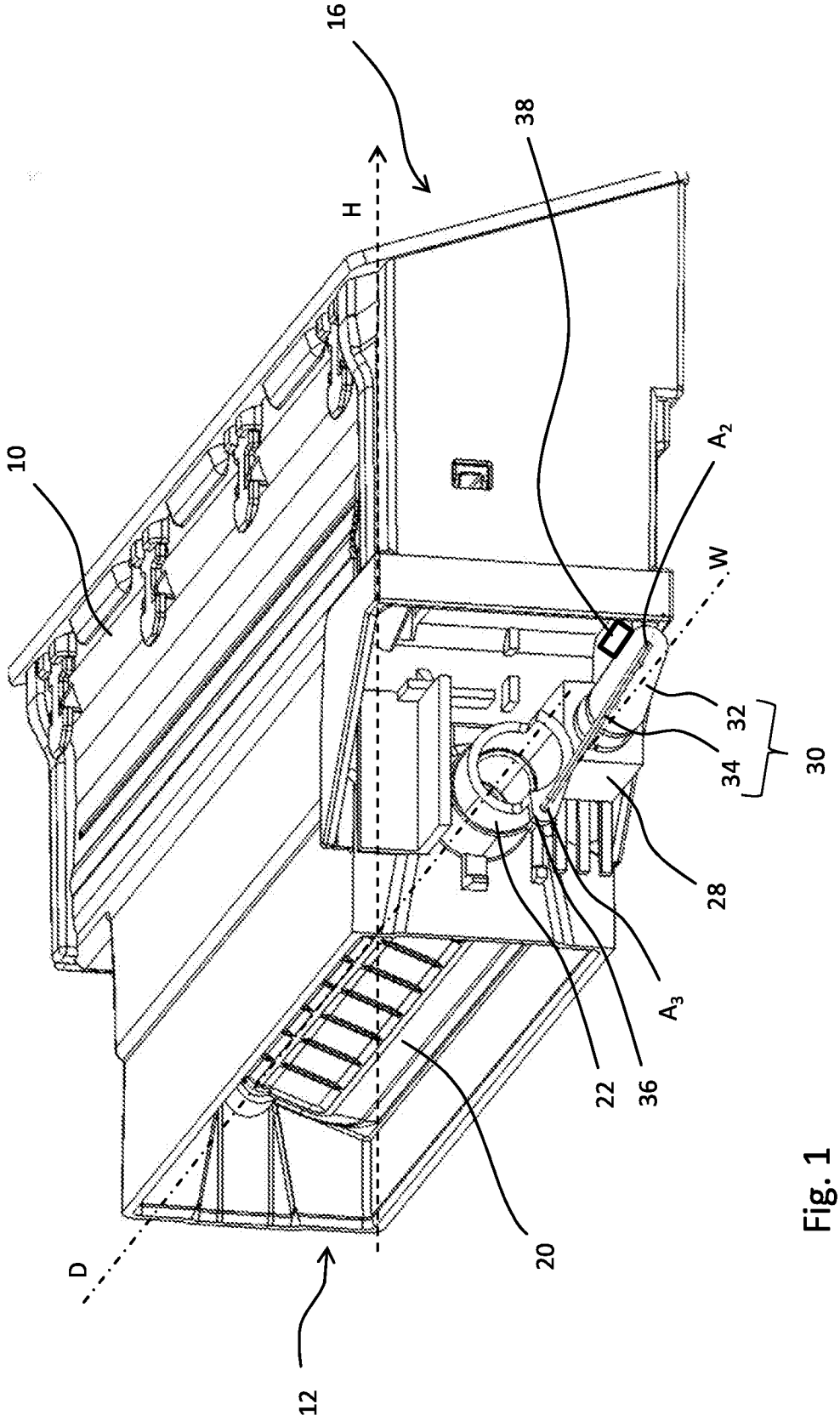


Fig. 1

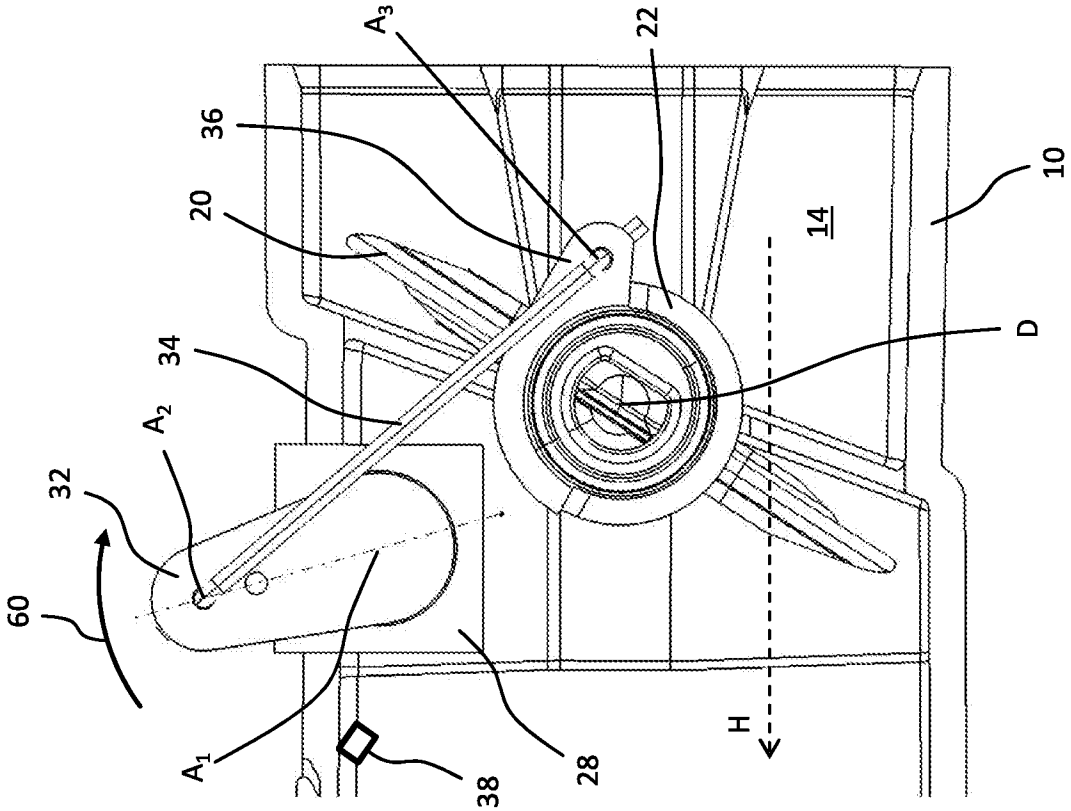

A3
22
36
10
20
14
D
34
A2
32
60
A1
38
28
H

Fig. 3

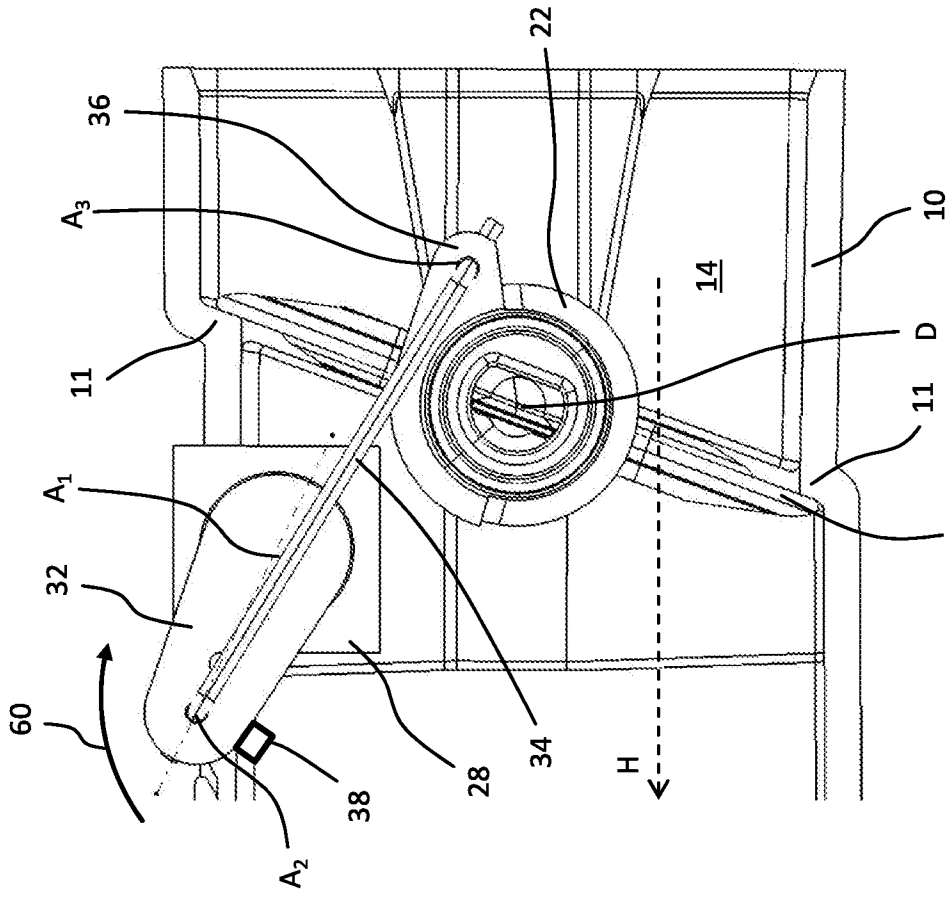

22
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Fig. 2

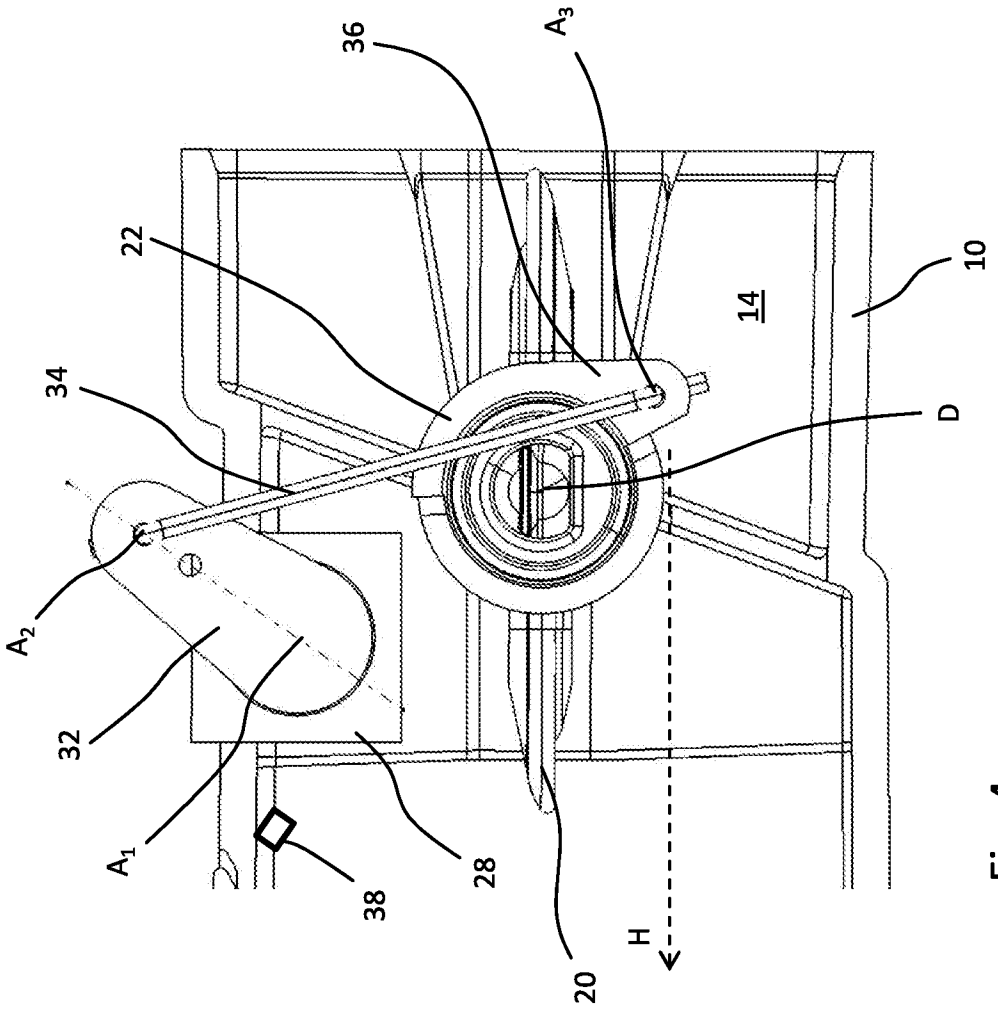


Fig. 4

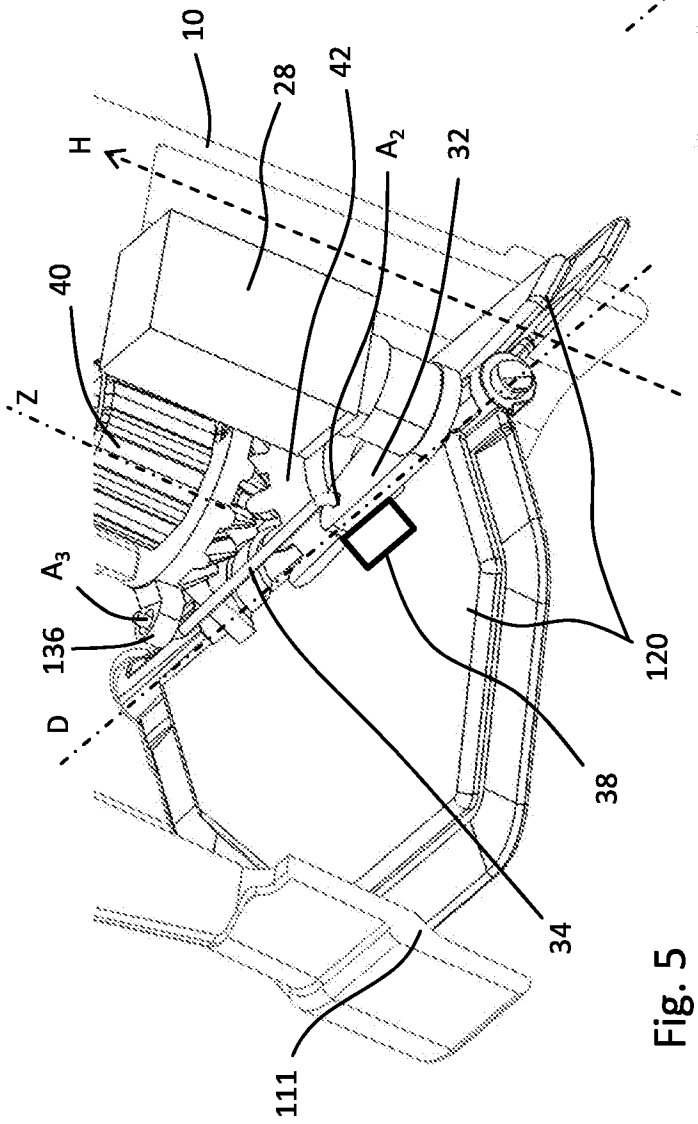

10
28
42
H
A2
32
40
Z
A3
136
D
120
38
34
111

Fig. 5

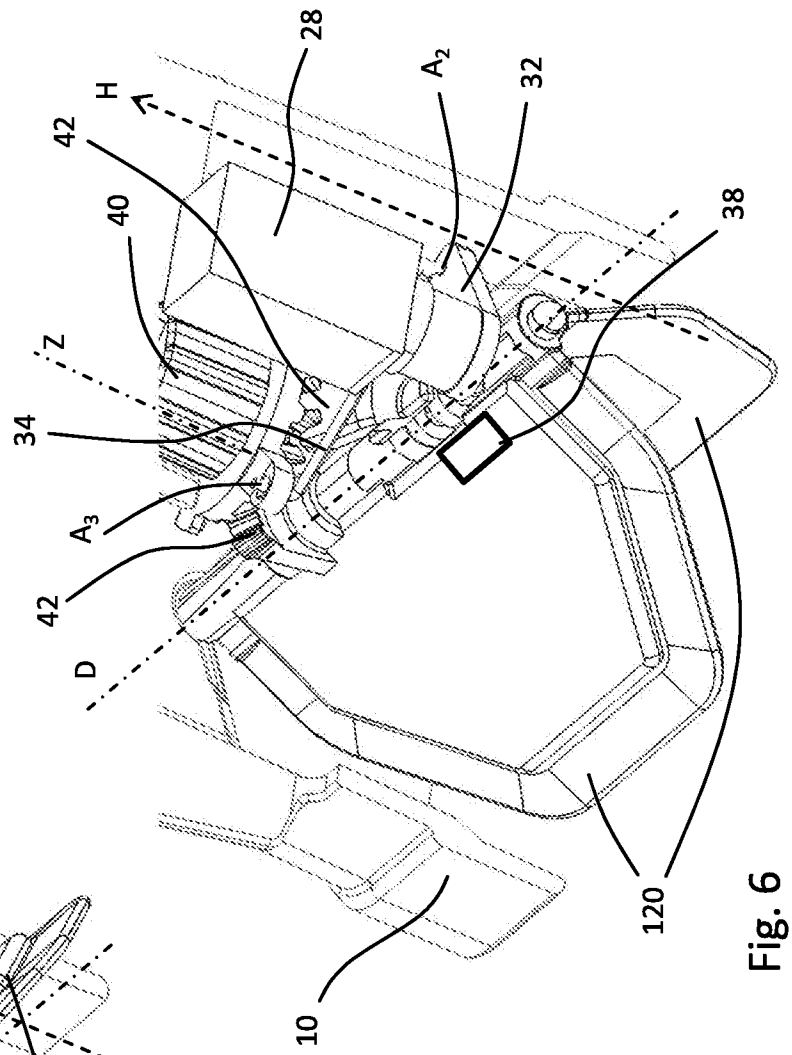

28
A2
32
H
42
40
38
Z
34
A3
42
D
10
120

Fig. 6

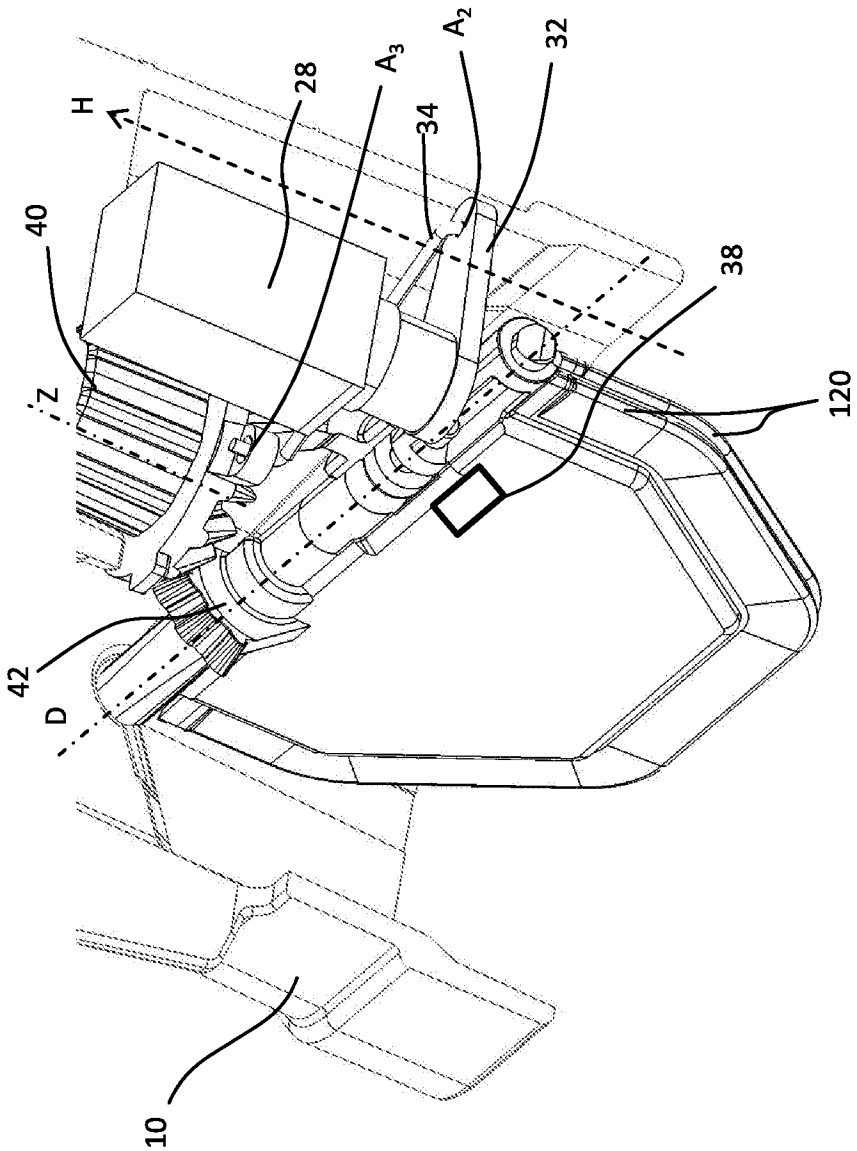


Fig. 7

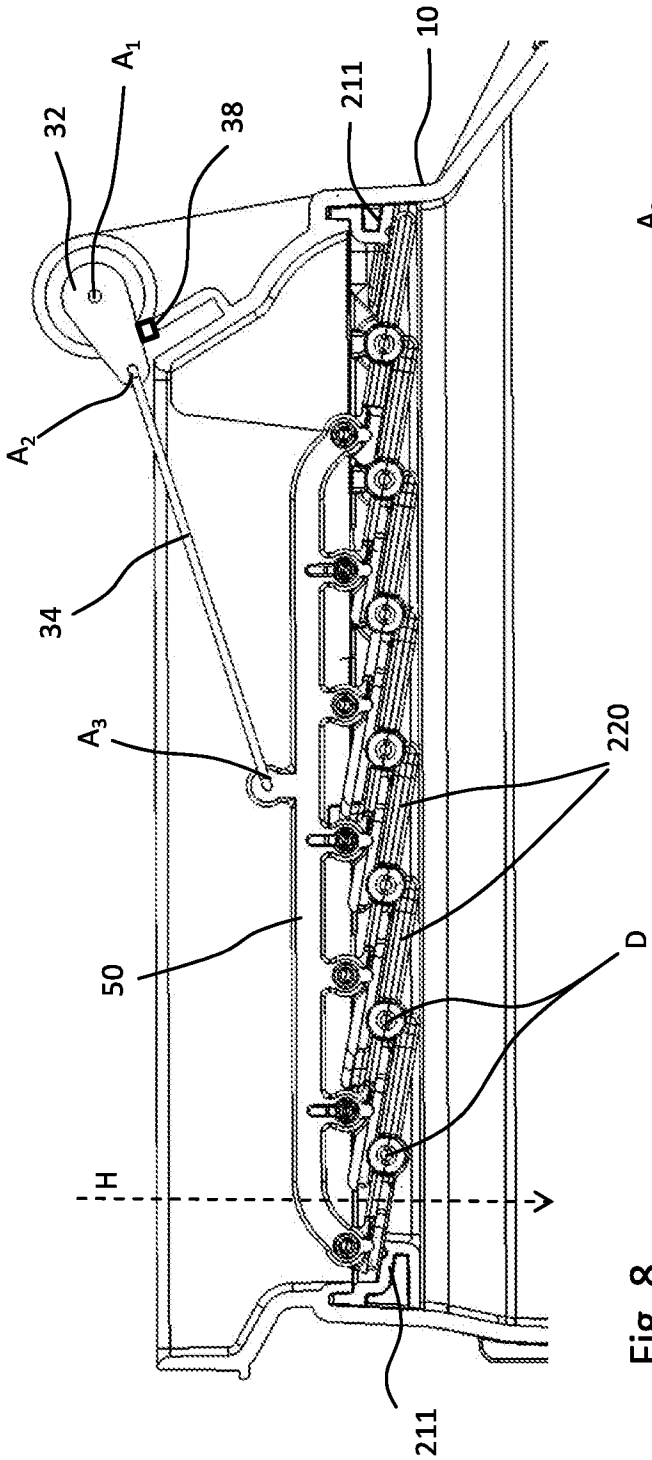

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A_1
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211
10
A_2
34
A_3
220
50
D
H
V
211

Fig. 8

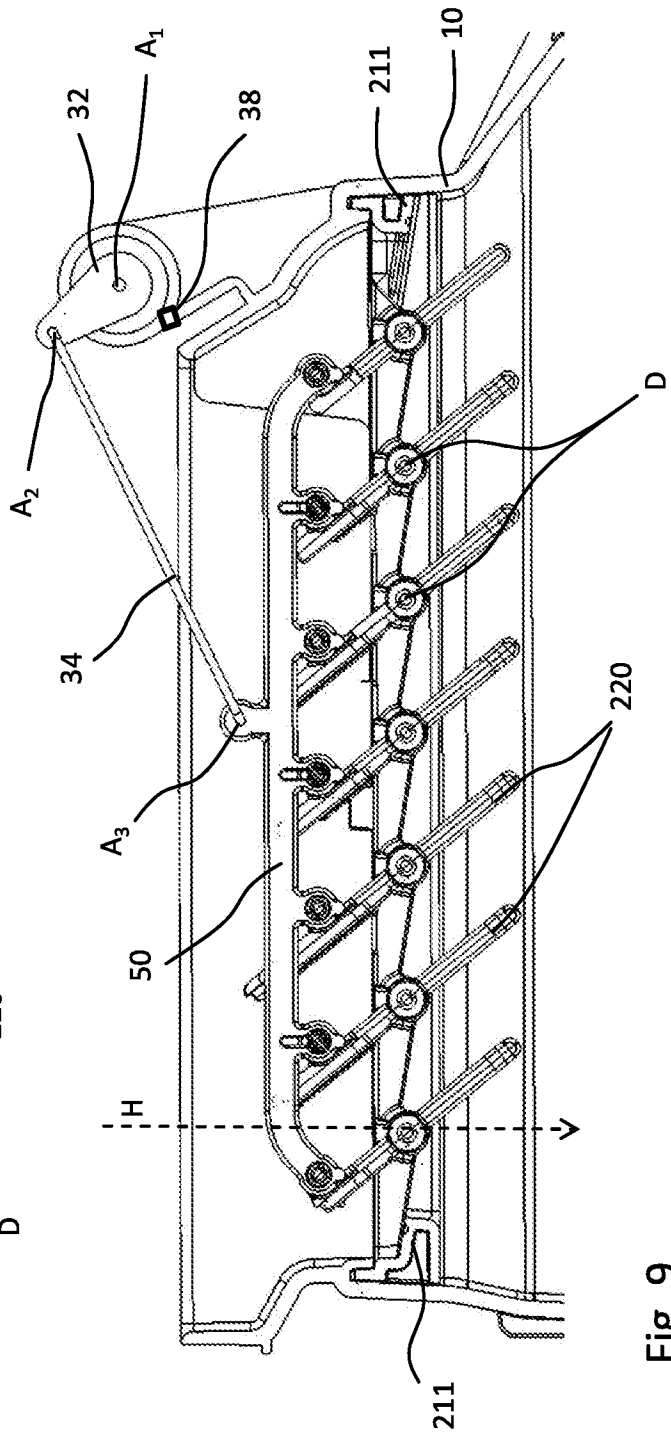

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A_1
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211
10
D
A_2
34
220
A_3
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H
V
211

Fig. 9

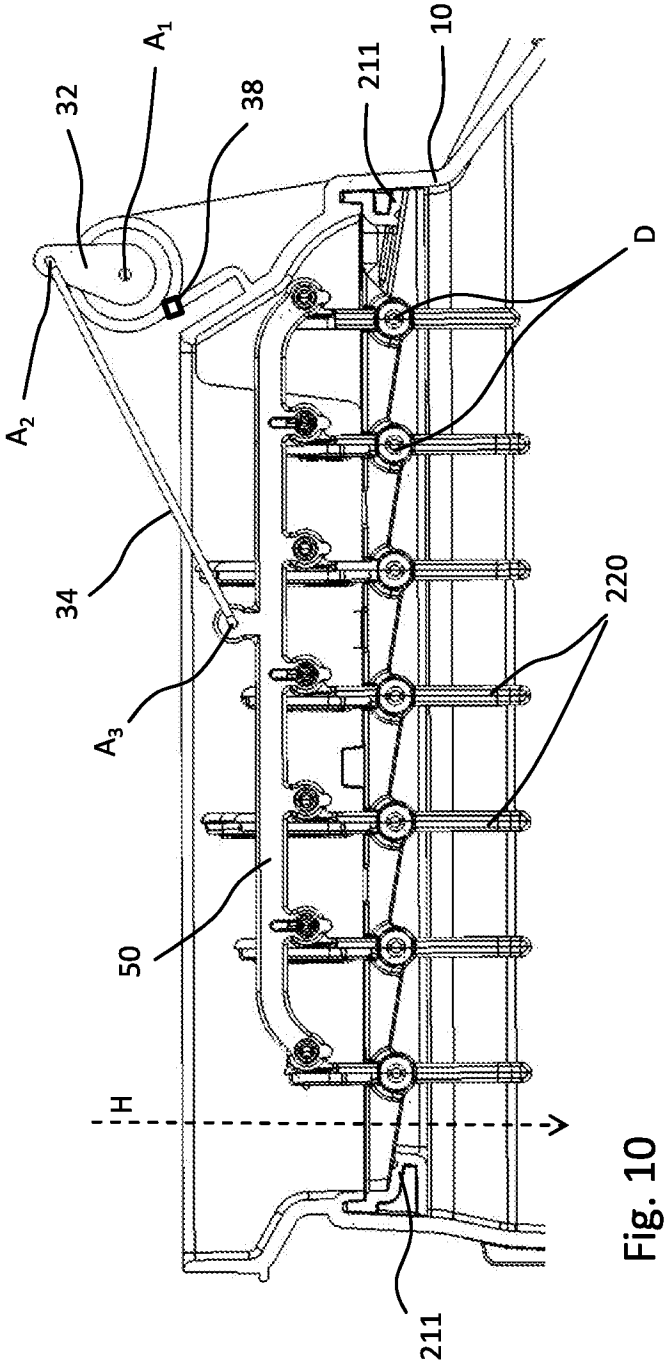

32
A_1
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211
10
A_2
D
34
A_3
220
50
H
211

Fig. 10

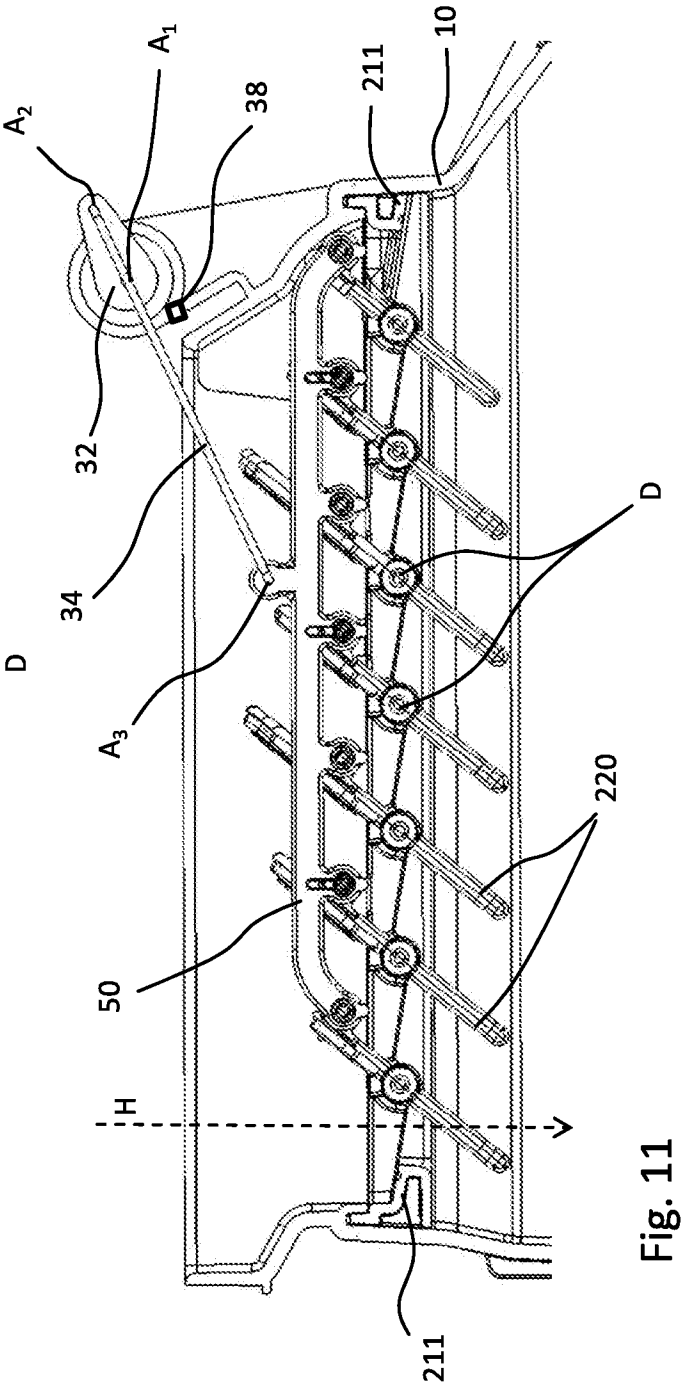

A_1
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211
38
A_2
32
D
34
A_3
220
50
H
211

Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/046610

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60H1/34 F24F13/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60H F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 100 571 755 B1 (WORY IND CO LTD [KR]) 11 April 2006 (2006-04-11)	1-4,6-10
A	paragraphs [0018] - [0020]; figures 1-8	5
A	KR 101 666 459 B1 (YUJIN-REYDEL CORP [KR]) 14 October 2016 (2016-10-14) paragraph [0006]; figure 1	1-10
A	EP 1 226 991 A1 (SILA HOLDING PLASTICA S R L [IT]) 31 July 2002 (2002-07-31) paragraphs [0007] - [0015]; figures 1-7	1-10
A	EP 1 829 722 A1 (SCHULTZ GMBH AURORA [DE]) 5 September 2007 (2007-09-05) paragraphs [0020] - [0031]; figures 1-3	1-10
A	JP 2000 006652 A (KOJIMA PRESS KOGYO KK) 11 January 2000 (2000-01-11) paragraphs [0020] - [0083]; figures 1-9	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 November 2019	18/11/2019

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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